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# PUBLIC HEALTH REPORTS

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## PREVENTION OF MALARIA.

### SUGGESTIONS ON HOW TO SCREEN THE HOME TO KEEP OUT EFFECTIVELY THE MOSQUITOES WHICH SPREAD THE DISEASE.

By R. H. VON EZDORF, Surgeon, United States Public Health Service.

The season is approaching when people are considering the screening of their homes against mosquitoes and flies.<sup>1</sup> Too often are details omitted, and the result of screening is found to be ineffective, or, in fact, often useless, so that the house is made a trap for mosquitoes rather than mosquito-proof.

A few suggestions on screening will be given and discussed under the following heads:

Material: Size of mesh; preservation; cost.

Screening of doors and windows: Precautions to be taken.

Screening of other openings.

Where mosquitoes enter.

Care of screens and repairs.

Economic value of screening; an example.

#### Material.

Wire netting is made of iron wire, painted black; of galvanized steel wire; and of copper or bronze. It may be bought in rolls containing a strip of netting 100 feet in length and 24, 26, 28, 30, 32, 36, or 40 inches in width. This netting is also graded according to the size of its mesh, and is known as 12, 14, 16, and 18 mesh, which means that there are 12, 14, 16, or 18 strands of wire to the linear inch in either direction. This can be determined by taking an inch rule, placing it on the netting and counting the strands to each inch, the number of strands corresponding with the grade, namely, 16 strands for a 16 mesh, etc.

The black iron wire netting is usually of a 12 or 14 mesh and is not to be recommended for the purposes under consideration.

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<sup>1</sup> It is to be borne constantly in mind that frequently the breeding of mosquitoes in and around a community can be so controlled that screening against mosquitoes will be unnecessary. The need for screening against flies, of course, still remains where they are present.

The best size mesh for all purposes is the 18 mesh. A 16 mesh is quite efficient, and, if carefully painted, will practically be equal to an 18 mesh, the paint also serving as a preservative.

Even copper or bronze wire should be treated with some varnish or paint, as it is likely to oxidize and corrode when exposed in a damp climate, particularly near the seashore.

In painting wire screening the paint should be lightly daubed on the wire so that it will not run and fill up the openings.

Wire netting is usually sold at prices per 100 square feet. The approximate retail prices of the different kinds are here given:

	Per 100 square feet.
12-mesh black iron wire netting.....	\$1. 25
14-mesh black iron wire netting.....	1. 80
16-mesh galvanized steel wire netting.....	2. 50
18-mesh galvanized steel wire netting.....	2. 90
16-mesh bronze wire netting.....	5. 25
18-mesh bronze wire netting.....	6. 00

The cost of a roll can therefore be easily calculated—for example, a roll of galvanized steel wire, 16-mesh, 100 feet long, 36 inches wide, contains 300 square feet, and at \$2.50 per 100 square feet will cost \$7.50.

#### Screening of Doors and Windows.

*Doors.*—All doors should be made to open outward, should have a good spring, and should be well constructed.

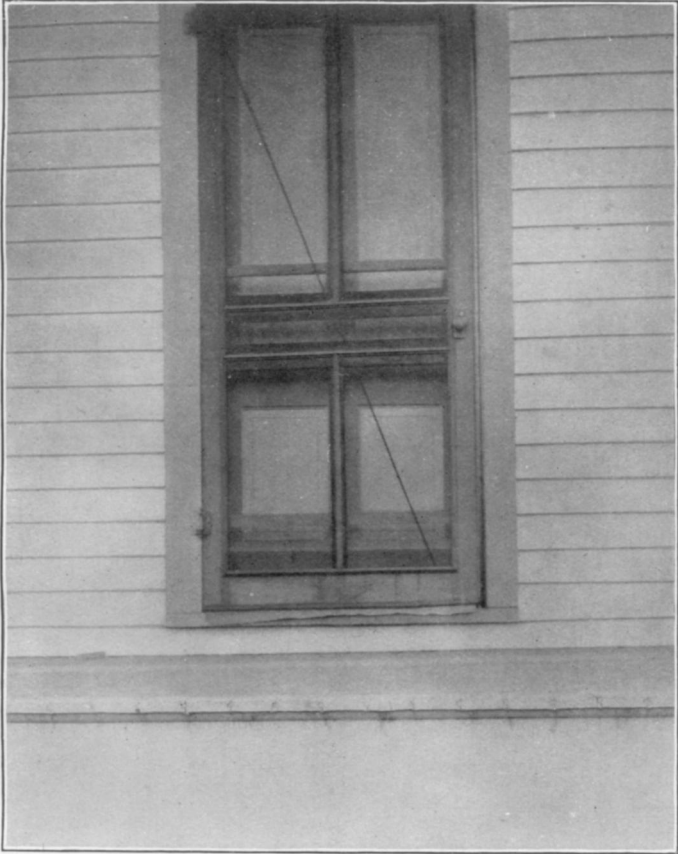
Where mosquitoes are in great abundance, the construction of a screened vestibule with two entrance doors often becomes necessary.

The defects most commonly observed in screen doors are that they do not fit, and that they are made of very thin and unseasoned wood frames and of coarse (12 mesh) wire netting.

There are on the market ready-made door and window screens made of three-fourths inch wood framing and finished with 12 and 14 mesh wire. These are, to say the least, very poor investments, and within a few weeks after use are often next to useless for the purpose intended.

To be of proper construction, a doorframe should be made of cypress or other seasoned wood 1 inch to 1½ inches thick, well braced and painted. The wire should be of 16 or 18 mesh. The lower panel should be covered on the inner side with a one-fourth inch mesh wire guard to protect the screening. If this is not provided, two or three strips of wood 1 inch wide, set 3 inches apart, should be nailed across the lower panel and two or three such strips of wood placed over the lower portion of the top panel. This provision is made for the protection of the screening in pushing the door open.

It is not an unusual experience in certain climates to have doors, even the best, to swell or warp, so that they will not close, and after



SCREEN DOOR CLOSED; CANVAS ON LOWER END OF DOOR.

planing them so that they will close the wood will shrink in warm weather, leaving a crack one-half inch or more, where mosquitoes might enter.

An easy fitting door, fully one-fourth inch clear all around the edge, is best, and to make it mosquito proof it will be necessary only to tack a strip of light canvas 1 inch wide around the top and one side of the door facing on the outer side (not on the screen door), so that when the door closes this canvas will take up all the lost or extra space. To the lower edge, on the outer side of the door, a strip of canvas may be tacked to cover any opening existing. This measure is not ornamental, but it is effective.

Some use strips of wood nailed to the inner side of the door jambs against which the door strikes. This is usually satisfactory, but doors will warp lengthwise, so that the top and bottom will not strike such facing strips, and thus leave spaces at the top and bottom. The canvas strips suggested have been found to be more generally satisfactory to meet this defect.

The door should, of course, have a spring which will keep it closed firmly.

*Windows.*—A window is probably the most common place of entrance for mosquitoes. Windows are frequently screened with a view to easy removal of the screen and for the easy opening and closing of shutters. For this reason the telescoping and adjustable screens are most commonly used and sold. This type of screen is made of wood or angle-iron material for the frames and furnished with 12 or 14 mesh iron wire. At best, these screens are not effective, as mosquitoes will work their way between the lapping ends. The halfway or half-window sliding screens provided with guides, well made, are efficient but costly. When using this type, the window must be kept wide open so that the sash will fit close to the frame of the screen.

The most efficient method of screening a window is to screen the entire opening. A well-fitting screen frame which is screwed into place so that it can be removed at the end of the season is probably the best.

Another method, less expensive than that of constructing a frame, is to cover the window with wire netting tacked to the window facing, and cover the edges with narrow strips of wood, nailed down to keep the wire netting flat against the woodwork and hold it firmly in place. Cotton mosquito netting, which will serve for a period of time and possibly for the entire season, provided care is taken with it, might be used in this way.

Where shutters or outer blinds are also used, a tight-fitting frame may be employed, with the lower end of the frame material arranged with a trapdoor covered with canvas, or the frame may be made to

extend within 4 to 6 inches of the sill and the remainder closed in with a board on hinges, or heavy canvas covering.

### Screening of Other Openings.

Other places to be absolutely screened are the fireplaces, openings into chimneys for stove pipes, drain holes, ice-box drips through floors, and the like.

The chimneys above the fireplaces must not merely be stuffed with newspapers and sacking, but should be absolutely closed with cotton material or netting.

The complaint is often made that a great deal of money is spent in screening a house and that it has proved useless, and, upon questioning or examining such a place, we find that the occupant has failed to tightly screen the fireplaces, not knowing that mosquitoes will enter through the chimney.

The fireplaces should therefore be completely sealed. If there is a metal cover, or fire board, used to close the fireplace during the summer, then this should have the openings along the edges completely closed by pasting paper over them, or adhesive plaster might be used.

A piece of unbleached sheeting or heavy paper may be used to close the opening. This is to be tacked into place and laths are to be used to hold the edges firm. The paper might be pasted.

If the fireplace is constructed of iron, brick, tile, stone, or other material not permitting the use of nails or tacks, adhesive plaster 2 inches wide may be employed, one-half of the width being used to hold the edge of the cotton material, the other half to fasten it in place. The hearth is usually of stone or brick, so that adhesive plaster will be serviceable in any case.

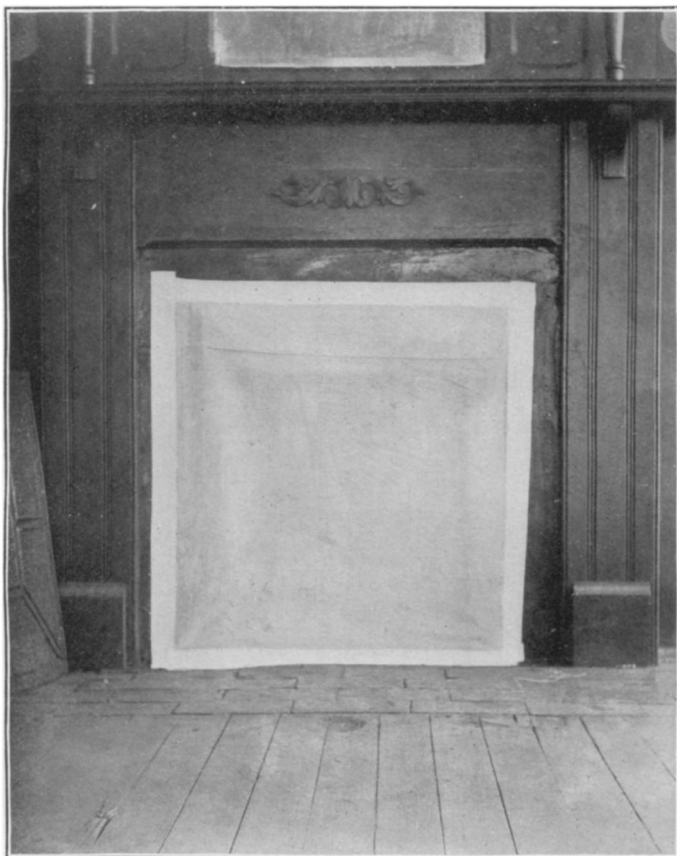
If the porches are screened, the holes at the bottom for draining off water should also be screened. Every precaution must be taken to close all openings securely. If the house is not of tight construction, it may require papering of the interior of the rooms.

### Where Mosquitoes Enter.

Mosquitoes will enter a house in search of blood (only the female mosquito bites, not the male), as this food stimulates and accelerates ovulation, that is, the laying of eggs.

Mosquitoes usually find entrance through defective screens, such as those of 12 or 14 mesh wire; corroded or torn wire screens; the sides of poorly fitting screen doors and window screens. They enter through chimneys, drain holes, and in fact any opening which is of sufficient size.

Anopheles, or malaria-bearing mosquitoes, in particular, have the faculty of searching for and finding such defects. Anopheles mos-



FIREPLACE PROPERLY SEALED AGAINST MOSQUITOES, COVERED WITH UNBLEACHED MUSLIN AND FIXED INTO PLACE BY ADHESIVE PLASTER

quitoes, it should be remembered, usually take their flight at night—that is, as soon as dusk or twilight comes on—so that it is generally reckoned that their flight is during the hours between sunset and sunrise. These mosquitoes are attracted to houses by light. Other mosquitoes are frequently attracted in the same way. *Anopheles* mosquitoes do not content themselves on finding when they first alight that the entrance to a house is closed to them by screens, but seek to find any opening by which they can enter. It is therefore important that every accessible opening into a house which might permit the entrance of mosquitoes be carefully closed.

It is very generally accepted that the *Anopheles*, or malaria-bearing mosquitoes, do not fly high and therefore do not enter rooms on the second or third floors of a house; but it has also been found that these mosquitoes will fly over the tops of houses and, when attracted by the reflected light from chimneys, will enter by that way through the fireplaces into the house.

#### Care of Screens.

Many persons upon opening a screen door will push against the wire netting or use the foot against the wire netting on the lower panel. As a result, the screen will soon become torn from its fastenings. The measures for protecting the netting have already been given.

Cheap material, such as black iron wire, will soon corrode, and holes will appear before the season is half over. It is not unusual to see people carefully close a screen door that has holes in the wire large enough to push the hand through. And again, people will carefully trim the torn wire so as to have a neat and clean cut edge, leaving an opening, and yet expect protection.

In repairing torn wire screening, a small piece of wire netting cut to size should be placed over the torn opening and fixed into place by sewing or lacing with a strand of the wire.

#### Economic Value of Screening.

The protection against the bite of the mosquito protects against the spread of malaria and contributes to comfort.

One example of the good effect of screening, and the economic value derived therefrom, is the history of a family at Scott, Ark., cited by Dr. Henry Thibault, which is here given:

This family, comprising nine members, gave a history of having suffered attacks of malarial fevers every season during three years. The medical attendance cost on an average of \$175 per year. Under direction of Dr. Henry Thibault, the attending physician, measures against the breeding of mosquitoes in and about the home, and for the screening of all windows, doors, and open hallways, were adopted. After this was done the family lived in the house for four years, and the bills for medical attendance averaged only \$15 to \$20 per year.



It was estimated that the cost of screening the house in this instance was \$40.

**The Cost of Screening a Cottage.**

The following is given as an example of the cost of material for effectually screening a house, using 16-mesh galvanized wire netting, which will cost \$2.50 per 100 square feet. The cost of labor is not included in this estimate.

The windows are to be screened by tacking the wire netting directly on the window facing with half-round material over the edges, giving it a neat finish.

*Size of windows.*

- 10 windows, each 6 feet 8 inches high, 2 feet 10 inches wide.
- 4 windows, each 5 feet high, 2 feet 10 inches wide.

The 10 windows 6 feet 8 inches high would each require a piece of netting 3 feet wide and 7 feet long, and the 4 windows 5 feet high pieces 3 feet wide and 5 feet 6 inches long.

	Square feet.	
10 windows 7 by 3 feet would therefore require.....	210	
4 windows 5½ by 3 feet would require.....	66	
Total.....	276	
Total cost screening for windows, at \$2.50 per 100 square feet.....		\$6. 90
2 doors, estimated to cost \$3 each.....		6. 00
Half-round material, 400 feet, for 14 windows.....		2. 00
Tacks, 25 cents; nails, 50 cents.....		. 75
If frames for windows are made, wood framing material, 400 linear feet, ¾ inch thick and 2 inches wide, would cost.....		5. 30
Estimated cost of screws.....		. 50
Total.....		21. 45

If the screen frames are to be hung on hinges, there would be an additional cost for 14 pairs of hinges.